WHAT IS CLAIMED IS:

1. A method for switching and routing, while logically managing and controlling, multichannel optical signals in an optical communication system, comprising the steps of:

(a) providing an optical package (OP) array as an array of H rows by W columns, denoted as an [H x W] dimensioned OP array, of (i) optically connected optical switch (OS) elements, wherein a said optical switch (OS) element at a row h and a column w, for h = 1 to H, and, w = 1 to W, respectively, is denoted as OS(h,w), (ii) optically connected left input ports and bottom side input ports, and, (iii) optically connected right output ports and top side output ports, whereby each said optical switch (OS) element is a device dynamically activated by an external control and features characteristics of:

(1) selectivity to a particular wavelength, λ;

(2) when said optical switch (OS) element is not activated, said optical switch (OS) element is transparent, by inducing very small loss, to light in a wavelength range of a multichannel optical signal; and

(3) when said optical switch (OS) element is activated, then part of said light at a particular wavelength, λ, is diverted at a pre-determined angle, whereby percentage of said light diverted compared to percentage of said light not diverted is a function of level of activation of said optical switch (OS) element, and, whereby said activated optical switch (OS) element is transparent to all other wavelengths; and

(b) providing a management and control logic mechanism (MCLM) operatively connected to said optical package array, for logically managing and controlling the switching and routing of said light entering and exiting said optical switch (OS) elements via said optically connected left side input ports and bottom side input ports, and, via said optically connected right side output ports and top side output ports, and, for preventing a conflict of

routing components with a same said wavelength, λ, of the optical signals from different said input ports to a same said output port.

2. The method of claim 1, whereby said optical package (OP) array features characteristics of:

(1) said light may travel by entering and/or exiting along said rows and/or along said columns of said optical package (OP) array, whereby (I) said light may enter a said row h at left side of said optical package (OP) array via a corresponding said left side input port, (II) said light may enter a said column w at bottom side of said optical package (OP) array via a corresponding said bottom side input port, (III) said light may exit from a said row h at right side of said optical package (OP) array via a corresponding said right side output port, and, (IV) said light may exit from a said column w at top side of said optical package (OP) array via a corresponding said top side output port; and

(2) said light diverted by a particular said optical switch (OS) element is grouped with other said light entering same said optical switch (OS) element and traveling in a same direction as said diverted light.

3. The method of claim 2, whereby said optical package (OP) array features additional characteristics of:

(3) all said optical switch (OS) elements in a said column w are selective to a specific said wavelength, λ_w;

(4) when said light traveling in a said row h hits a said active optical switch (OS) element in a said column w, at least a portion of λ_w component of said light is diverted upwards, joining any other said light traveling in same said column; and

(5) when said light traveling in a said column w hits a said active optical switch (OS) element in a said row h, at least a portion of said λ_w component of said light is diverted to said right side, joining any other said light traveling in a same said row.

4. The method of claim 1, whereby each said optical switch (OS) element is a voltage controlled Electroholography based optical switch.

5. The method of claim 1, whereby a plurality of said optical package (OP) arrays are used as optical package (OP) building blocks, OPBBs, for forming a scaled-up optical package (OP) array featuring P*Y rows and Q*X columns of said OS elements, wherein each said OP building block, OPBB(p,q), for p = 1 to P, and q = 1 to Q, is composed of Y rows and X columns of said OS elements, and, whereby said OPBBs are chained according to: for said p = 1 to P-1, and, said q = 1 to Q-1, all 1 to said Y rows at right side of said OPBB(p,q) are optically connected to corresponding rows at left side of OPBB(p,q+1), and, all 1 to said X columns at top side of said OPBB(p,q) are optically connected to corresponding columns at bottom side of OPBB(p+1,q).

6. The method of claim 1, whereby a plurality of said optical package (OP) arrays are used for forming an all optical cross connect (AOXC) chained optical package (COP) architecture featuring a three dimensional [N x M x K] array of said optical package (OP) arrays, where said N is number of input fibers, said M is number of output fibers, and, K is number of wavelengths λ_k, for k = 1 to K, per said fiber operated upon by said AOXC COP architecture.

7. The method of claim 6, whereby not all said K wavelengths operated upon by said AOXC COP architecture must be present in each said fiber.

8. The method of claim 6, whereby each said fiber may carry additional wavelengths other than said K wavelengths, said additional wavelengths may be different in said fibers.

9. The method of claim 6, whereby said AOXC COP architecture has two sets of optional components: (1) N input-residuals output fibers, where each said input residuals output fiber n, for n = 1 to N, is optically connected to a corresponding input residuals output port n of said AOXC COP architecture, for carrying portions of the optical signals from said input fibers that do not undergo switching, and, (2) M output-grouping input fibers, where each said output-grouping input fiber m, for m = 1 to M, is optically connected to a corresponding output-grouping input port m of said AOXC COP architecture, for carrying the optical signals into said output fibers from sources other than from said input fibers.

10. The method of claim 6, whereby said AOXC COP architecture further includes a set of output signals, denoted as U leftover signals, optionally used for said logical management and control purposes by said logical management and control mechanism.

11. The method of claim 6, whereby said AOXC COP architecture is independently extendable in said three dimensions, to a [N' x M' x K'] AOXC COP architecture, where said N' is equal to or greater than said N, said M' is equal to or greater than said M, and, said K' is equal to or greater than said K.

12. The method of claim 6, whereby said AOXC COP architecture is used for forming a basic chained input (BCI) AOXC COP architecture based on chaining of M [N x K] dimensioned said OP arrays, having chain length of said M, whereby each said optical package array OP(m), for m = 1 to M, is composed of N rows and K columns, and, features characteristics of:

(1) for said m = 1 to M, all said OS elements in column k, for k = 1 to K, of said array OP(m) are selective to wavelength λ_k;

(2) for n = 1 to N, said input fiber n is optically connected to said input port n of said AOXC chain, which is at left side of row n of array OP(1);

(3) for $m = 1$ to $M-1$, rows 1 to N at right side of said array OP(m) are optically connected to rows 1 to N at left side of said array OP(m+1), respectively, forming N chained rows of said OP arrays; and

(4) for said $n = 1$ to N, optional input-residuals fiber n is optically connected to a corresponding input-residuals output port n of said AOXC chain, located at right side of row n of said array OP(M).

13. The method of claim 6, whereby said AOXC COP architecture is used for forming a three dimensional (3-D) array of said optical switch (OS) elements, whereby said 3-D array features characteristics of:

(1) three axes, an input axis, I, an output axis, O, and, a wavelength axis, W;

(2) each layer (plane) in said 3-D array is denoted by two of said axes each said layer (plane) is parallel to, and a layer number;

(3) output layers are denoted IW_m , whereby each said output layer is parallel to said IxW plane and is in distance m from origin of said 3-D array, whereby in this direction said 3-D array has M+2 said layers denoted IW_0, IW_1, ..., IW_m, ..., IW_M, IW_{M+1}, said IW_1 to IW_M are M output planes, said IW_0 is input-connections and optional input-residuals layer, and, said IW_{M+1} is a second-switching management and control layer;

(4) said wavelength layers are denoted IO_k, whereby each said wavelength layer is parallel to said IxO plane and is in distance k from origin of said 3-D array, whereby in this direction said 3-D array has said K layers denoted IO_1, ..., IO_k, ..., IO_K, corresponding to said K wavelengths λ_1 to λ_K, carried via said input ports;

(5) input layers are denoted OW_n , whereby each said input layer is parallel to said OxW plane and is in distance n from origin of said 3-D array, whereby in this direction, said 3-D array has N+2 layers denoted OW_1, ..., OW_n, ..., OW_N, OW_{N+1}, OW_{N+2}, said OW_1 to OW_N are said N input planes, said OW_{N+1} is output ports plane, said OW_{N+2} is third-switching management and control layer;

(6) each said OS element is denoted by triple indices ($OS_{n,m,k}$), whereby said n is input layer index, varying from 1 to N+2; said m is output layer index, varying from 0 to M+1; and, said k is wavelength layer index, varying from 1 to said K; and

(7) each switching path (SP) connecting said k-th wavelength of said n-th input port to said m-th output port is denoted by triple indices ($SP_{n,m,k}$), whereby said n is input port index, varying from 1 to said N; said m is output port index, varying from 1 to said M; and, said k is wavelength index, varying from 1 to said K.

14. The method of claim 6, whereby said AOXC COP architecture is used for forming a [T x Z x W] dimensioned management AOXC COP architecture incorporated as part of said management and control logic mechanism, for said logically managing and controlling up to W wavelengths of a group of T managed signals via a group of Z management and control signals, and, a group of U leftover signals, said management AOXC COP architecture filters out portions of up to W wavelength components of said T managed signals, and, routes said filtered out portions into said group of said Z management and control signals, and, into said group of said U leftover signals, said portion of each of said T managed signals not filtered out by said management AOXC COP architecture continues in direction of each corresponding said managed signal as a carry-over signal for further said managing and controlling, and/or, switching and routing, the optical signals in the optical communication system.

15. A system for switching and routing, while logically managing and controlling, multichannel optical signals in an optical communication system, comprising:

(a) an optical package (OP) array as an array of H rows by W columns, denoted as an [H x W] dimensioned OP array, of (i) optically connected optical switch (OS) elements, wherein a said optical switch (OS) element at a row h and a column w, for h = 1 to H, and, w = 1 to W, respectively, is denoted as OS(h,w), (ii) optically connected left side input ports and bottom side input ports, and, (iii) optically connected right side output ports and top side output ports, whereby each said optical switch (OS) element is a device dynamically activated by an external control and features characteristics of:

(1) selectivity to a particular wavelength, λ;

(2) when said optical switch (OS) element is not activated, said optical switch (OS) element is transparent, by inducing very small loss, to light in a wavelength range of a multichannel optical signal; and

(3) when said optical switch (OS) element is activated, then part of said light at a particular wavelength, λ, is diverted at a pre-determined angle, whereby percentage of said light diverted compared to percentage of said light not diverted is a function of level of activation of said optical switch (OS) element, and, whereby said activated optical switch (OS) element is transparent to all other wavelengths; and

(b) a management and control logic mechanism (MCLM) operatively connected to said optical package array, for logically managing and controlling the switching and routing of said light entering and exiting said optical switch (OS) elements via said optically connected left side input ports and bottom side input ports, and, via said optically connected right side output ports and top side output ports, and, for preventing a conflict of routing components with a same said wavelength, λ, of the optical signals from different said input ports to a same said output port.

16. The system of claim 15, whereby said optical package (OP) array features characteristics of:

(1) said light may travel by entering and/or exiting along said rows and/or along said columns of said optical package (OP) array, whereby (I) said light may enter a said row h at left side of said optical package (OP) array via a corresponding said left side input port, (II) said light may enter a said column w at bottom side of said optical package (OP) array via a corresponding said bottom side input port, (III) said light may exit from a said row h at right side of said optical package (OP) array via a corresponding said right side output ports, and, (IV) said light may exit from a said column w at top side of said optical package (OP) array via a corresponding said top side output port; and

(2) said light diverted by a particular said optical switch (OS) element is grouped with other said light entering same said optical switch (OS) element and traveling in a same direction as said diverted light.

17. The system of claim 16, whereby said optical package (OP) array features additional characteristics of:

(3) all said optical switch (OS) elements in a said column w are selective to a specific said wavelength, λ_w;

(4) when said light traveling in a said row h hits a said active optical switch (OS) element in a said column w, at least a portion of λ_w component of said light is diverted upwards, joining any other said light traveling in same said column; and

(5) when said light traveling in a said column w hits a said active optical switch (OS) element in a said row h, at least a portion

of said λ_w component of said light is diverted to said right side, joining any other said light traveling in a same said row.

18. The system of claim 15, whereby each said optical switch (OS) element is a voltage controlled Electroholography based optical switch.

19. The system of claim 15, whereby a plurality of said optical package (OP) arrays are used as optical package (OP) building blocks, OPBBs, for forming a scaled-up optical package (OP) array featuring P*Y rows and Q*X columns of said OS elements, wherein each said OP building block, OPBB(p,q), for p = 1 to P, and q = 1 to Q, is composed of Y rows and X columns of said OS elements, and, whereby said OPBBs are chained according to: for said p = 1 to P-1, and, said q = 1 to Q-1, all 1 to said Y rows at right side of said OPBB(p,q) are optically connected to corresponding rows at left side of OPBB(p,q+1), and, all 1 to said X columns at top side of said OPBB(p,q) are optically connected to corresponding columns at bottom side of OPBB(p+1,q).

20. The system of claim 15, whereby a plurality of said optical package (OP) arrays are used for forming an all optical cross connect (AOXC) chained optical package (COP) architecture featuring a three dimensional [N x M x K] array of said optical package (OP) arrays, where said N is number of input fibers, said M is number of output fibers, and, K is number of wavelengths λ_k, for k = 1 to K, per said fiber operated upon by said AOXC COP architecture.

21. The system of claim 20, whereby not all said K wavelengths operated upon by said AOXC COP architecture must be present in each said fiber.

22. The system of claim 20, whereby each said fiber may carry additional wavelengths other than said K wavelengths, said additional wavelengths may be different in said fibers.

23. The system of claim 20, whereby said AOXC COP architecture has two sets of optional components: (1) N input-residuals output fibers, where each said input residuals output fiber n, for n = 1 to N, is optically connected to a corresponding input residuals output port n of said AOXC COP architecture, for carrying portions of the optical signals from said input fibers that do not undergo switching, and, (2) M output-grouping input fibers, where each said output-grouping input fiber m, for m = 1 to M, is optically connected to a corresponding output-grouping input port m of said AOXC COP architecture, for carrying the optical signals into said output fibers from sources other than from said input fibers.

24. The system of claim 20, whereby said AOXC COP architecture further includes a set of output signals, denoted as U leftover signals, optionally used for said logical management and control purposes by said logical management and control mechanism.

25. The system of claim 20, whereby said AOXC COP architecture is independently extendable in said three dimensions, to a [N' x M' x K'] AOXC COP architecture, where said N' is equal to or greater than said N, said M' is equal to or greater than said M, and, said K' is equal to or greater than said K.

26. The system of claim 20, whereby said AOXC COP architecture is used for forming a Basic Chained Input (BCI) AOXC COP architecture based on chaining of M [N x K] dimensioned said OP arrays, having chain length of said M, whereby each said optical package array OP(m), for m = 1 to M, is composed of N rows and K columns, and, features characteristics of:

(1) for said m = 1 to M, all said OS elements in column k, for k = 1 to K, of said array OP(m) are selective to wavelength λ_k;

(2) for n = 1 to N, said input fiber n is optically connected to said input port n of said AOXC chain, which is at left side of row n of array OP(1);

(3) for m = 1 to M-1, rows 1 to N at right side of said array OP(m) are optically connected to rows 1 to N at left side of said array OP(m+1), respectively, forming N chained rows of said OP arrays; and

(4) for said n = 1 to N, optional input-residuals fiber n is optically connected to a corresponding input-residuals output port n of said AOXC chain, located at right side of row n of said array OP(M).

27. The system of claim 20, whereby said AOXC COP architecture is used for forming a three dimensional (3-D) array of said optical switch (OS) elements, whereby said 3-D array features characteristics of:

(1) three axes, an input axis, I, an output axis, O, and, a wavelength axis, W;

(2) each layer (plane) in said 3-D array is denoted by two of said axes each said layer (plane) is parallel to, and a layer number;

(3) output layers are denoted IW_m , whereby each said output layer is parallel to said IxW plane and is in distance m from origin of said 3-D array, whereby in this direction said 3-D array has M+2 said layers denoted IW_0, IW_1, ..., IW_m, ..., IW_M, IW_{M+1}, said IW_1 to IW_M are M output planes, said IW_0 is input-connections and optional input-residuals layer, and, said IW_{M+1} is a second-switching management and control layer;

(4) said wavelength layers are denoted IO_k, whereby each said wavelength layer is parallel to said IxO plane and is in distance k from origin of said 3-D array, whereby in this direction said 3-D array has said K layers denoted IO_1, ..., IO_k, ..., IO_K, corresponding to said K wavelengths λ_1 to λ_K, carried via said input ports;

(5) input layers are denoted OW_n, whereby each said input layer is parallel to said OxW plane and is in distance *n* from origin of said 3-D array, whereby in this direction, said 3-D array has N+2 layers denoted OW_1, ..., OW_n, ..., OW_N, OW_{N+1}, OW_{N+2}, said OW_1 to OW_N are said N input planes, said OW_{N+1} is output ports plane, said OW_{N+2} is third-switching management and control layer;

(6) each said OS element is denoted by triple indices ($OS_{n,m,k}$), whereby said n is input layer index, varying from 1 to N+2; said m is output layer index, varying from 0 to M+1; and, said k is wavelength layer index, varying from 1 to said K; and

(7) each switching path (SP) connecting said k-th wavelength of said n-th input port to said m-th output port is denoted by triple indices ($SP_{n,m,k}$), whereby said n is input port index, varying from 1 to said N; said m is output port index, varying from 1 to said M; and, said k is wavelength index, varying from 1 to said K.

28. The system of claim 20, whereby said AOXC COP architecture is used for forming a [T x Z x W] dimensioned management AOXC COP architecture incorporated as part of said management and control logic mechanism, for said logically managing and controlling up to W wavelengths of a group of T managed signals via a group of Z management and control signals, and, a group of U leftover signals, said management AOXC COP architecture filters out portions of up to W wavelength components of said T managed signals, and, routes said filtered out portions into said group of said Z management and control signals, and, into said group of said U leftover signals, said portion of each of said T managed signals not filtered out by said management AOXC COP architecture continues in direction of each corresponding said managed signal as a carry-over signal for further said managing and controlling, and/or, switching and routing, the optical signals in the optical communication system.